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A EUROPEAN PRIVET SAWFLY, *MACROPHYA PUNCTUMALBUM* (L.): NORTH AMERICAN DISTRIBUTION, HOST PLANTS, SEASONAL HISTORY AND DESCRIPTIONS OF THE IMMATURE STAGES (HYMENOPTERA: TENTHREDINIDAE)

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Abstract.—*Macrophya punctumalbum* (L.), a widespread European sawfly known in North America previously from Ontario, Quebec and British Columbia, is recorded from New York; this is a new United States record. Known host plants are members of the Oleaceae, with privet (*Ligustrum* spp.) appearing to be the primary food plant. Seasonal history and habits were studied at Ithaca, New York, during 1982–83. Overwintering occurs in the last larval (or prepupal) stage. Adults begin to appear in mid- to late May. Eggs, laid under the upper epidermis of leaves, begin to hatch by early to mid-June, larvae mature by early to mid-July, and drop to the ground by late August to construct earthen cocoons. Adult feeding produces irregular "rasping" marks and rectangular holes on the upper leaf surfaces, and larvae chew circular holes in the leaves. A diagnosis of the adult is given, and the egg and last instar larva are described and illustrated.

Macrophya punctumalbum (L.), a European privet sawfly, occurs widely in all of Europe (including the British Isles) to the Caucasus (Benson, 1952; Schwenke, 1982). It is the only species of the genus *Macrophya* Dahlbom known from the Nearctic and Palearctic Regions. Presumably introduced into Canada from Europe some time in the early 1900s or before, it is now well established in eastern Canada (numerous records given by Gibson, 1980). Earliest records are from Toronto, Ontario, in 1932, and Vancouver, British Columbia, in 1934 (Gibson, 1980).

Our attention first focused on this introduced sawfly as early as the spring of 1979, when one of us (WTJ) noticed unfamiliar feeding damage to an ornamental planting of California privet (*Ligustrum ovalifolium* Hassk.) on the Cornell University campus (Ithaca, New York). At that time, no adult or larval insect could be associated with the damage. It was not until late May 1983, when we collected adult females of *M. punctumalbum*, that we were able to implicate this sawfly as the pest species involved.

In this paper we review the North American distribution of this introduced species and give new United States records based on our own collecting in New York. We also summarize our observations on the biology, habits, and seasonal history at Ithaca, New York; provide recognition features for the adults; and describe and illustrate the egg and last instar larva.

North American Distribution

In addition to published records from Ontario, Quebec and British Columbia (Gibson, 1980: 133), the following new records for the United States can be given.

New York: Tompkins Co., Ithaca (Cornell University campus, Red Barn), 24 May 1982, early June 1982, and additional collections in May and early June 1983. *Niagara Co.*, Niagara Falls, 12 June 1983 (this record is based solely on adult feeding damage to California privet (*L. ovalifolium*) in a hedge of a private residence). A thorough examination of undetermined sawflies in the Cornell University Insect Collection produced a single female specimen collected at Ithaca, NY, in late May 1975.

Host Plants and Damage

Known host plants of *M. punctumalbum* are members of the olive family, the Oleaceae. *Fraxinus* and *Ligustrum* appear to be the primary hosts across its native European range (Enslin, 1913; Korolkov, 1913; Schwenke, 1982). *Fraxinus excelsior* L. and *Ligustrum vulgare* L. are recorded as hosts in the British Isles (Cameron, 1882; Benson, 1952). Pomerantzev (1930) observed the species causing "considerable damage to ash [*F. excelsior*] in European Russia." Korolkov (1913) noted that larvae of this sawfly severely damaged ash trees in the Alexander Garden (Moscow, Russia), "the leaves being skeletonized."

In North America (eastern Canada), Gibson (1980) recorded "*Fraxinus penns.*" [= *F. pennsylvanica* Marsh.] and "*F. americana*?" as hosts, citing ecological data from labels affixed to specimens examined during the course of his studies of North American *Macrophya*. Since 1940, *M. punctumalbum* has been found infesting privet hedges in the Toronto area (Ontario) (Anon., 1949; Brown, 1942; Foott, 1973). In addition, it has caused "serious injury to privet hedges" in the St. Catharines area (Niagara Peninsula, Ontario) (Anon., 1959), and in Montreal, Quebec (Anon., 1965).

Gibson (1980) noted that *M. punctumalbum* has been reared from *Syringa* (lilac) in Canada; *Syringa villosa* Vahl. was cited as an associated host plant at Etobicoke Twp. (Toronto metropolitan area). At our study site, at least two species of *Syringa* (*S. vulgaris* L. and *chinensis* Willd.) occur within 15 meters of the privet hedge where our observations were made; foliage of only the common lilac (*S. vulgaris*) showed some feeding damage by *M. punctumalbum*.

On California privet, adult feeding damage consisted of irregular "rasping" marks on the upper epidermis of leaf surfaces (Fig. 1). Adult sawflies also produce shiny, black fecal material which is deposited as irregular tarlike spots (up to 2 mm in diameter) on the upper leaf surfaces and new shoots (Fig. 1). These fecal spots wash or drop off the leaves by late summer.

Early instar larvae excavate circular holes (1–3 mm in diameter) in the interior of the leaves (Fig. 2). Larval feeding occurs primarily, if not exclusively, on the lower surfaces, except in the final feeding stage. The young larvae move into a curled (head to tail) posture to feed. Mature, full-grown larvae (Fig. 3), which reach a maximum length of about 18 mm, are capable of consuming the foliage, leaving only the midrib and lateral veins intact.

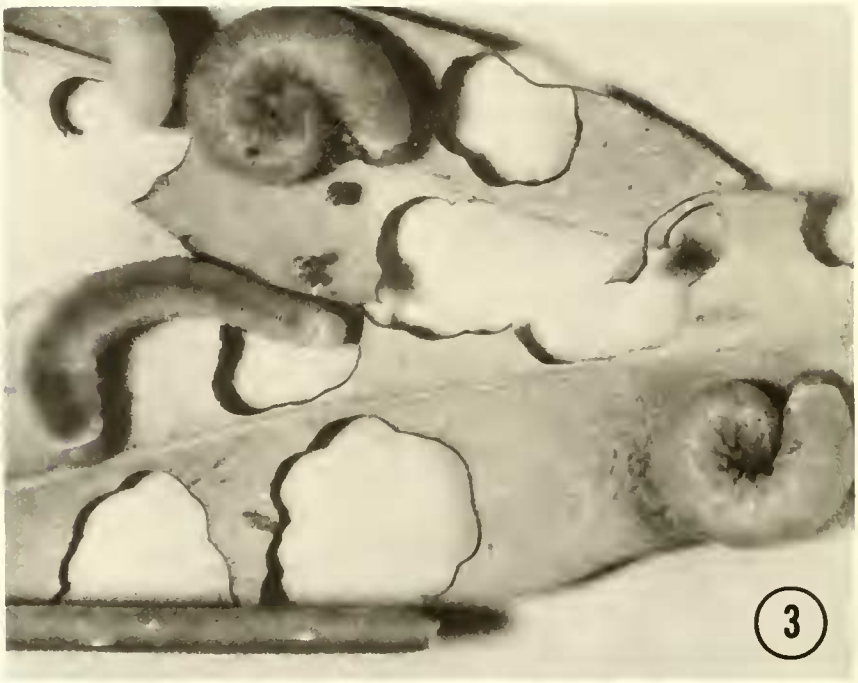
Seasonal History and Habits

The biology and habits of *M. punctumalbum* in Europe given by Pomerantzev (1930), Korolkov (1913), and Mrkva (1965) are similar to what we report here, based on our observations at Ithaca, New York, during 1982–83.

Adults (predominantly females; males are generally scarce) first appeared on

Figs. 1–2. Privet foliage damaged by European privet sawfly, *Macrophya punctumalbum*. 1, Privet foliage damaged by adult sawfly feeding, characterized by the irregular "rasping" marks and rectangular holes, and the tarlike spots. 2, Feeding damage by adults and larvae; the small round holes in the interior of the leaves and the irregular leaf margins are caused by larvae.

privet foliage and began feeding by mid- to late May of both seasons, producing characteristic "rasping" marks and rectangular holes on the leaf surfaces. By June 6 (in 1982), females had oviposited under the upper epidermis of leaves, with eggs placed singly or in chains of 2–7. The oviposition site is marked by a small "blister" (per single egg), usually at the apex or periphery of the leaf (Fig. 5A, B). The embedded eggs are also visible from the under surface of the leaf. Also on June 6, early instar larvae were present on the foliage and beginning to feed. Females apparently oviposit over an extended period as first instar larvae can be found in the field until late June. Adult females become scarce by mid- to late June, and disappear shortly thereafter. By early July, nearly mature larvae were found on the foliage, together with various intermediate stage larvae. By early August, fewer larvae can be found; mature larvae have dropped from the foliage and presumably go into the soil to construct earthen cocoons. However, some mature and intermediate stage larvae have been observed on the foliage as late as August 24 (in 1982). The last stage larva (or prepupa) probably overwinters. A single generation is produced annually on privet in New York. We collected or



Figs. 3–4. Life stages of the European privet sawfly, *Macrophya punctumalbum*. 3, Mature (feeding stage) larvae; note feeding damage and fecal pellets (length of mature larvae ranges from 14.4–18 mm). 4, Adult female on privet leaf.

observed very few adult males; the species is mainly parthenogenetic, with males poorly represented in most populations (Benson, 1952; Novak, 1976).

Economic Importance

Macrophya punctumalbum is expected to be of economic significance in North America. If adults and larvae occur in large numbers, its primary food plant (privet) can be defoliated. From our field and laboratory observations, feeding and oviposition occurs primarily on foliage of the tender, terminal shoots, and often on foliage of the shaded portions of the plantings. Recommended control measures, especially when the host plant is used in an ornamental hedge, may be simplified by hedge trimming in late spring before the larvae can mature.

Laboratory Studies

In 1982 we attempted to rear *M. punctumalbum* under caged conditions in a room with natural lighting and no temperature control. Temperatures during these studies ranged from 26°C (in the summer) to 11°C (in the winter). Six adult females were caged on May 19, 1982, with two potted, nursery-grown plants of *Ligustrum ovalifolium*. The cage (30.5 × 30.5 × 91.5 cm) was covered on 3 sides and the top with a fine mesh ninon fabric; the front, a sliding door, was made of clear Plexiglas, approx. 3 mm thick.

The adult sawflies immediately began feeding. As foliage was depleted, twigs from uninfested *L. ovalifolium* plants were stuck into the pots as a food supplement. By May 27 the potted plants were nearly defoliated and were removed from the cage. The supplemental twigs were placed in a container of water-saturated sand and all remaining foliage from the potted plants was removed and attached to the supplemental food plants. Two days later 2 new potted plants, *Ligustrum* × *vicaryi* Rehd., also nursery grown, were placed in the cage. Within two days all adult sawflies were dead, presumably killed by a residual insecticide on the foliage of these new plants. Eggs had been laid in leaves of new plants and also were apparent in the supplemental foliage, as well as foliage taken from the original potted plants. On June 2 the progeny were found—14 days after the adults were first introduced into the cage. The larvae developed slowly. By mid-July the second pair of potted plants had been defoliated by larval feeding. From this time all food was from supplemental sources. By August 24, there were 35 larvae of various stages of development on the foliage. By September 10, larvae were abundant but there was little movement or feeding. By December, only 3 live, but quiescent, larvae were observed on the foliage. Observations were not made again until March 1983; no live larvae were found at that time. The soil and duff were removed from the cage and filtered through 3 sieves (screen sizes 8, 10 and 18). Twenty-two dead, shriveled larvae were found and no pupae. Thus, the rearing conditions were not suitable for pupation and the colony was lost.

Description

Adult recognition features.—Females of *M. punctumalbum* are unlikely to be confused with those of any other North American species of *Macrophya*. The bright, rufous hind femora, contrasting with the predominantly black body, distinguishes this attractive species (Fig. 4). All other North American *Macrophya*

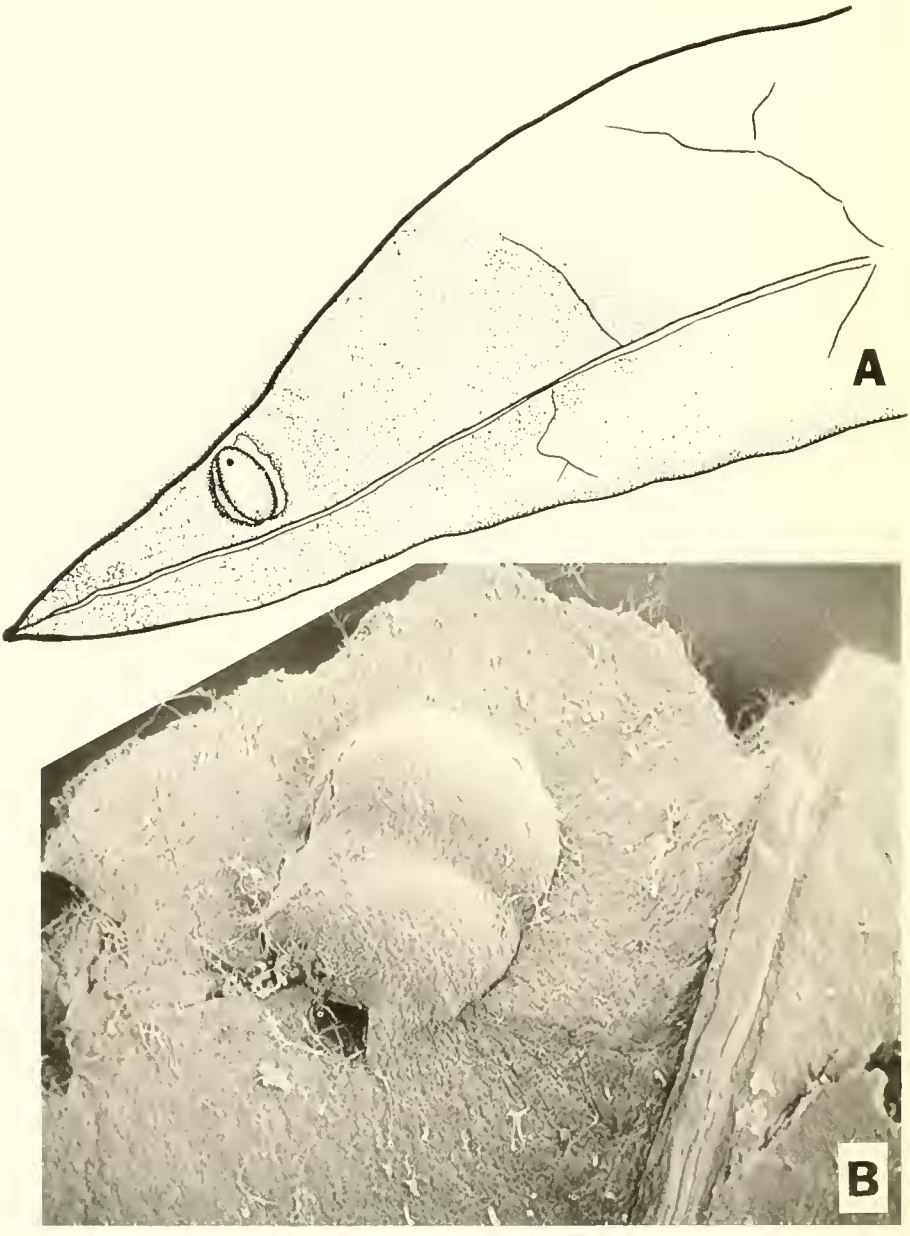


Fig. 5. Oviposition site of the adult female of *Macrophya punctumalbum*. A, schematic drawing illustrating the "blisterlike" oviposition wound. B, scanning electron photomicrograph of the same (30×).

have a black or black and white hindfemur. The body and appendages of the female are black with the following areas white or white-yellow: small spots along the occipital carina of the head; broad area along the posterior margin of the pronotum; large spot over most of the scutellum, and the scutellar appendage;

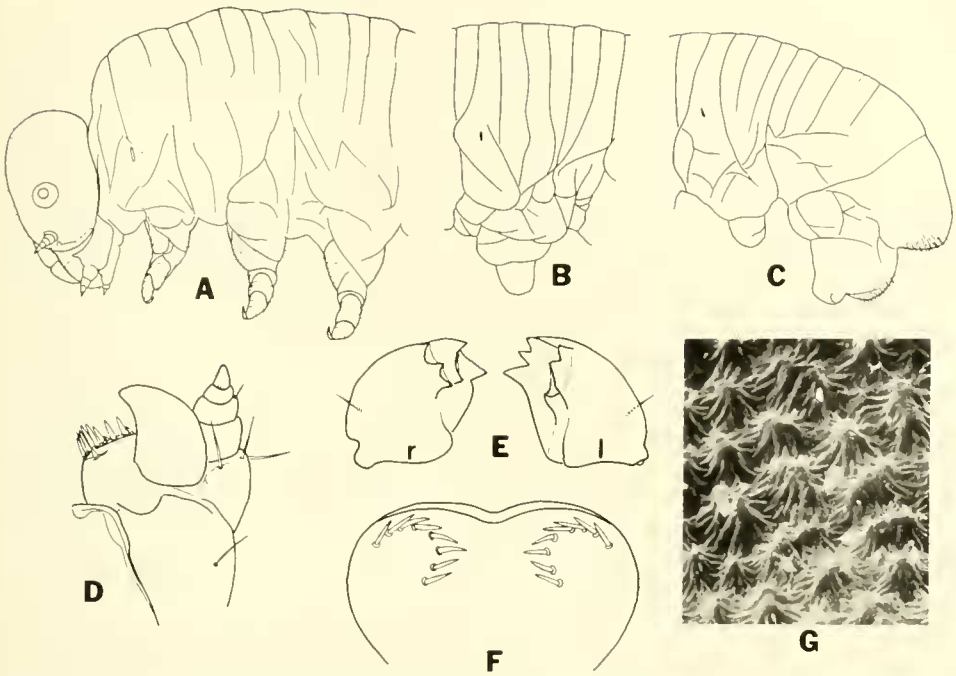


Fig. 6. Mature (feeding stage) larva of *Macrophya punctumalbum*. A, Head and thorax. B, Third abdominal segment. C, Eighth, ninth and tenth abdominal segments. D, Maxilla, dorsal. E, Right (r) and left (l) mandibles, ventral. F, Epipharynx. G, Integument of abdominal annulet, scanning electron photomicrograph (700×).

anteroapical surfaces of the femora, and anterior surfaces of the tibiae and tarsi of the fore and middle legs; basolateral spot on the hindcoxa and elongate subapical spot on the hindtibia; and lateral tergal spots and ninth tergite dorsally of the abdomen. The male, which is usually smaller than the female, is almost entirely black. There are small white spots on the dorsoapical margin of the pronotum adjacent to the scutellum, and the fore and middle legs are similar in coloration to those of the female.

Description of egg, Fig. 5A, B.—Length 1.36–1.44 mm ($\bar{x}$ = 1.40 mm; n = 3); maximum width 0.68–0.88 mm ($\bar{x}$ = 0.76 mm; n = 3). Elongate-ovoid, somewhat depressed along the long axis. Chorion minutely sculptured at extremely high magnification (>2000×), otherwise nearly smooth at lower ranges of magnification (250–500×).

Description of larva, Fig. 6A-G.—Known larvae of Nearctic *Macrophya* are variously patterned with spots or bands on the head and body (Gibson, 1980). Mature larvae of *M. punctumalbum* are entirely lime green, except for the yellowish head capsule and a black eye spot. Lorenz and Kraus (1957) gave a brief description of the larva of *M. punctumalbum* and included it in a key to larvae of European *Macrophya*. Gibson also provided a short diagnosis of the larva.

In late instar (feeding stage), head capsule pale yellow-brown with black eye spot; thoracic legs pale green; body lime green above, somewhat paler below. Integument as in Fig. 6G. Length 14.5–18.0 mm ($\bar{x}$ = 16.6 mm; n = 11).

Clypeus usually with 2 setae on each side (individiuals sometimes with 3 setae on one side and 2 on the other; see remarks below). Labrum with 3 setae on each side, apical margin emarginate at middle; epipharynx with 8 clavate spines located in arcuate row on each anterolateral half (Fig. 6F). Each mandible with 1 seta on outer lateral surface; left mandible with 2 ventral teeth, 3 lateral teeth, and 1 molar tooth (Fig. 6E); right mandible with 3 lateral teeth and 3 molar teeth (Fig. 6E). Maxillary palpus four-segmented; second segment of palpus with 1 seta on outer surface at apex; palpifer with 3 setae; stipes with 1 seta; galea large, digitlike; lacinia with 8–9 clavate spines (Fig. 6D). Labial palpus three-segmented; 3 setae on each side of prementum at apex; second labial palpal segment with 1 seta on inner surface at apex.

Thorax without spines, tubercles or glandubae. Thoracic legs normal; femur longer than tibia; setae present on all surfaces of each segment. Prothoracic spiracles not winged.

Abdominal segments 1 through 8 each with 7 dorsal annulets (typical segment shown in Fig. 6B); without spines, tubercles or glandubae. Eighth, ninth and tenth segments as in Fig. 6C; also without spines, tubercles or glandubae. Fine setae numerous on suranal and subanal areas of tenth segment. All abdominal spiracles not winged.

Remarks.—The subgenus *Pseudomacrophya*, originally proposed by Enslin (1913) for the single species *M. punctumalbum*, differs from the nominate subgenus by the degree of convergence of the inner orbits of the eyes of the adults. Lorenz and Kraus (1957) stated that the larva of *M. punctumalbum* has 3 setae on the clypeus (on each side). They suggested, on the basis of this character and the one seta on each mandible, that *Pseudomacrophya* might be considered a valid genus. Of 22 mature larvae examined in our studies (by ERH), 18 had 2 setae on each side of the clypeus; however, 4 larvae had 3 setae on one side and 2 on the other. Also, in the New York populations, larvae lacked tubercles or glandubae on annulets 2 and 4 of the typical abdominal segment (Abd. 3) that Lorenz and Kraus (1957) reported for European material.

Acknowledgments

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